



FLOOD OF JULY  
IN THE  
PADDLE RIVER BASIN

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IN THE  
PADDLE RIVER BASIN

**Alberta**  
ENVIRONMENT




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MAY - 1 1987

Alberta Environment  
Water Resources Management Services  
Technical Services Division  
Hydrology Branch

FLOOD OF JULY 1986  
IN THE  
PADDLE RIVER BASIN

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Alberta Environment  
Water Resources Management Services  
Technical Services Division  
Hydrology Branch

The July 1986 runoff conditions throughout west-central Alberta were characterized by the headwaters of the Paddle River basin were not affected in the major storm centre, significant rainfall was still recorded. The precipitation for the July 1986 season is summarized in Table 1. The majority of precipitation fell within a 24-hour period on July 17. Maximum 24-hour totals ranged from 26.6 mm to 77.2 mm (1.04 to 3.04 inches). This concentration of the precipitation, coupled with the wet conditions in the area throughout July, produced flood flows in the headwaters of the Paddle River, particularly upstream of the Paddle River Dam.

Table 1: July 16 to 18, 1986 Precipitation

| Gauge Name                 | Location      | FLOOD OF JULY 1986<br>IN THE<br>PADDLE RIVER BASIN |      | Maximum |        |
|----------------------------|---------------|--|------|---------|--------|
|                            |               |  |      | 24-hour | Total  |
|                            |               |  |      | mm      | inches |
| Greenheart                 | Upper Paddle  | 49.4   | 1.94 | 55.2    | 2.17   |
| Little Paddle Saskatchewan | Little Paddle | 72.2   | 2.84 | 81.2    | 3.20   |
| Mayenthorpe                | Upper Paddle  | 46.2   | 1.82 | 55.2    | 2.17   |
| Paddle Dam                 | Upper Paddle  | 51.7   | 2.03 | 55.2    | 2.17   |
| Paddle headwaters          | Upper Paddle  | 67.3   | 2.65 | 76.9    | 3.03   |
| Twiss Lake                 | Twiss         | 36.6   | 1.44 | 36.6    | 1.43   |

2. Paddle River Near Anadarko

Flows at the Paddle River near Anadarko streamflow station flooded the recorder that was established in 1950. The flood peak at this station is estimated to have been 49.0 cubic metres per second (cms) (1,330 cubic feet per second (cfs)). The inflow peak to the Paddle River Dam is often approximated by doubling the value at the Anadarko station. Thus, a simple estimate of the Paddle Dam inflow would be 98.0 cms (2,660 cfs).

ALBERT E. SMITH  
HUMAN RESOURCES MANAGEMENT DIVISION  
TECHNOLOGY SERVICES DIVISION  
EDUCATION GROUP

UNITED STATES GOVERNMENT  
OFFICE OF THE SECRETARY  
WASHINGTON, D. C. 20540

NOVEMBER 1982

## 1. Precipitation

The July 1986 rainstorm produced extreme runoff conditions throughout west-central Alberta. Although the headwaters of the Paddle River basin were not situated in the major storm centre, significant rainfall was still recorded. The precipitation for the July 1986 storm is summarized in Table 1. The majority of precipitation fell within a 24-hour period on July 17. Maximum 24-hour totals ranged from 36.6 mm to 72.2 mm (1.44 to 2.84 inches). This concentration of the precipitation, coupled with the wet conditions in the area throughout July, produced flood flows in the headwaters of the Paddle River, particularly upstream of the Paddle River Dam.

Table 1: July 16 to 18, 1986 Precipitation

| Gauge Name               | Sub-Basin<br>Location | Maximum<br>24-Hour |        | Total |        |
|--------------------------|-----------------------|--------------------|--------|-------|--------|
|                          |                       | mm                 | inches | mm    | inches |
| Greencourt               | Little Paddle         | 43.4               | 1.71   | 58.2  | 2.29   |
| Little Paddle Headwaters | Little Paddle         | 72.2               | 2.84   | 81.5  | 3.21   |
| Mayerthorpe              | Upper Paddle          | 46.2               | 1.82   | 68.6  | 2.70   |
| Paddle Dam               | Upper Paddle          | 45.7               | 1.80   | 65.2  | 2.57   |
| Paddle Headwaters        | Upper Paddle          | 62.3               | 2.45   | 75.9  | 2.99   |
| Twin Lakes               | Twin                  | 36.6               | 1.44   | 56.4  | 2.22   |

## 2. Paddle River Near Anselmo

Flows at the Paddle River near Anselmo streamflow station flooded the recorder that was established in 1980. The flood peak at this station is estimated to have been 49.0 cubic metres per second (cms) (1,730 cubic feet per second (cfs)). The inflow peak to the Paddle River Dam is often approximated by doubling the value at the Anselmo station. Thus, a simple estimate of the Paddle Dam inflow would be 98.0 cms (3,460 cfs).





### 3. Paddle River Dam

The outflow of the Paddle River Dam is recorded at the Paddle River near Rochfort Bridge station. By backrouting these outflows and accounting for known storage changes in the reservoir, the inflow to the Paddle River Dam is determined. The calculated inflow peaked at 102 cms (3,600 cfs), which agrees well with the estimate using the Paddle River near Anselmo station. This represents the second largest flood peak recorded at this site since 1963, exceeded only by the 1965 event. A flood peak of this magnitude has a 6.7% chance of occurring in any one year, and over the long term would be expected to occur once every fifteen years.

During the July 1986 flood, the Paddle River Dam was not fully operational, as the second stage concreting of four of the seventeen closure joints in the conduit had not been completed. Thus at the onset of the flood, the reservoir was well below the permanent pool elevation. In addition, the control gates on the conduit were in a wide open position, and remained so throughout the flood. Still, the dam contributed significantly to reducing the flood peak downstream. Routing of the flood through the reservoir, even with the control gates wide open, reduced the flood peak. A total of 10,913 dam<sup>3</sup> (8,850 acre-feet) of water was stored in the reservoir. The outflow from the Paddle River Dam was held to a maximum of 47.4 cms (1,670 cfs), a 53% reduction in the inflow peak. The hydrographs are illustrated in Figures 2 and 3.

### 4. Little Paddle River Near Mayerthorpe

The flood on the Little Paddle River was not as severe as the Paddle River upstream of the Dam. The flood peaked at 45.6 cms (1,610 cfs). A flood peak of this magnitude has a 20% chance of occurring in any one year, and over the long term would be expected to occur once every five years.



## 5. Paddle River Near Sangudo

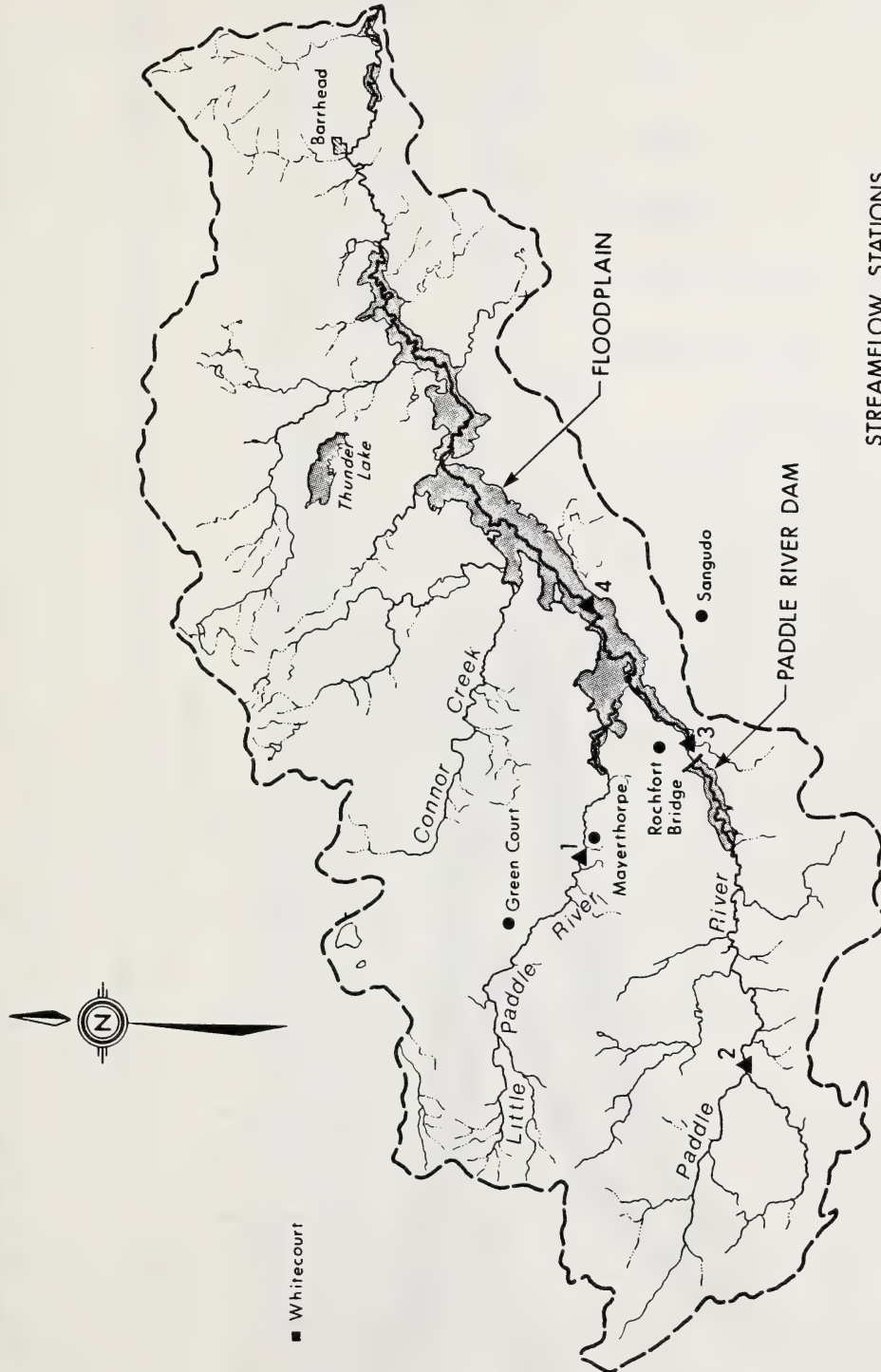
The streamflow station at this site was also damaged during the July 1986 flood. Miscellaneous discharge measurements taken by the Water Survey Section were used in reconstructing the flood hydrograph at this site. The runoff from the local area downstream of the Little Paddle River near Mayerthorpe and the Paddle River Dam to the Paddle River near Sangudo was estimated as a percentage of the Little Paddle River flow. The percentage was adjusted such that the hydrographs from the sub-areas, routed using the River Forecast Centre SSARR model of the basin, combined to reproduce the measured flows at Sangudo. The resulting hydrograph is shown on Figure 2. The estimated flood peak is 74.5 cms (2,630 cfs).

## 6. Paddle River at the Little Paddle River Confluence

Once the local area contribution to Sangudo was established, the SSARR model was used to provide estimates for the confluence. The peak for the July 1986 flood at the confluence is estimated to have been 80.5 cms (2,840 cfs). Without the Paddle River Dam, the flood peak at the confluence would have been in the order of 137 cms (4,820 cfs). This flow would have substantially exceeded channel capacity along the Paddle River, resulting in widespread flooding. Clearly, the Paddle River Dam prevented the floodplain from being widely inundated.







# STREAMFLOW STATIONS

- 1 - LITTLE PADDLE RIVER NEAR MAYERTHORPE
- 2 - PADDLE RIVER NEAR ANSELMO
- 3 - PADDLE RIVER NEAR ROCHFORD BRIDGE
- 4 - PADDLE RIVER NEAR SANGUDO



## TECHNICAL SERVICES DIVISION HYDROLOGY BRANCH

## PADDLE RIVER BASIN

SUBMITTED R. BOTHE, P. ENG.  
DATE DEC. 10, 1986

DESIGNED R. BOTHE, P. ENG.  
CHECKED

APPROVED M. MUSTAPHA, P. ENG.  
DATE DEC. 10, 1986

DRAWN V. DA SILVA  
CHECKED

SCALE 1" = 7 MILES APPROX.  
DATE DEC. 1986

FIGURE No. 1

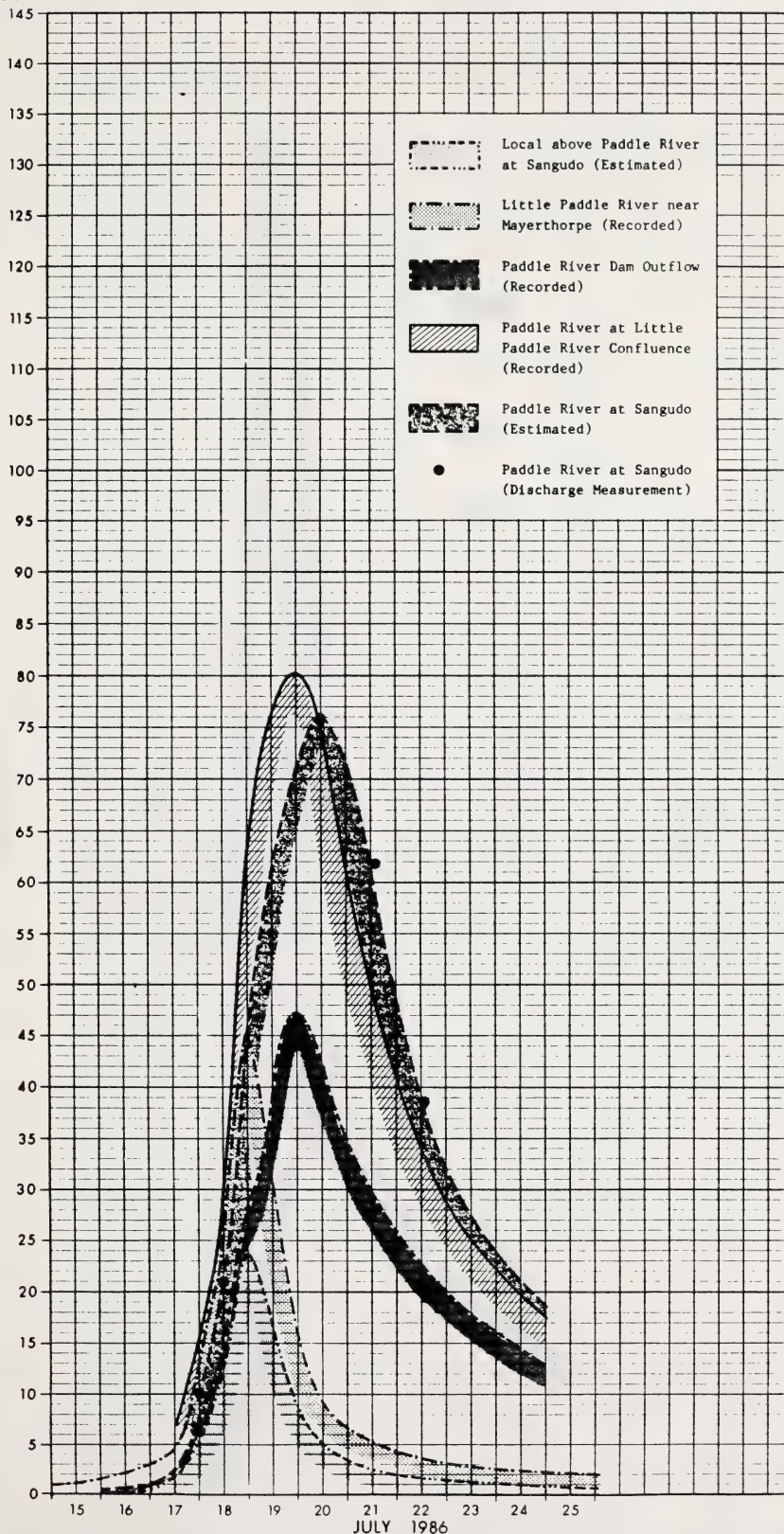


MICROFILM DATE

MICROFILM DATE

DRAWING No

DISCHARGE (CMS)


**Abena**  
 ENVIRONMENT

 TECHNICAL SERVICES DIVISION  
 HYDROLOGY BRANCH

 FLOWS RECORDED  
 DURING THE JULY 1986 FLOOD

 SUBMITTED R. BOTHE, P. ENG.  
 DATE NOV. 1986

 DESIGNED R. BOTHE, P. ENG.  
 CHECKED

 APPROVED M. MUSTAPHA, P. ENG.  
 DATE NOV. 1986

 DRAWN V. DA SILVA  
 CHECKED

 SCALE AS SHOWN  
 DATE NOV. 1986

FIGURE No. 2

FILE No

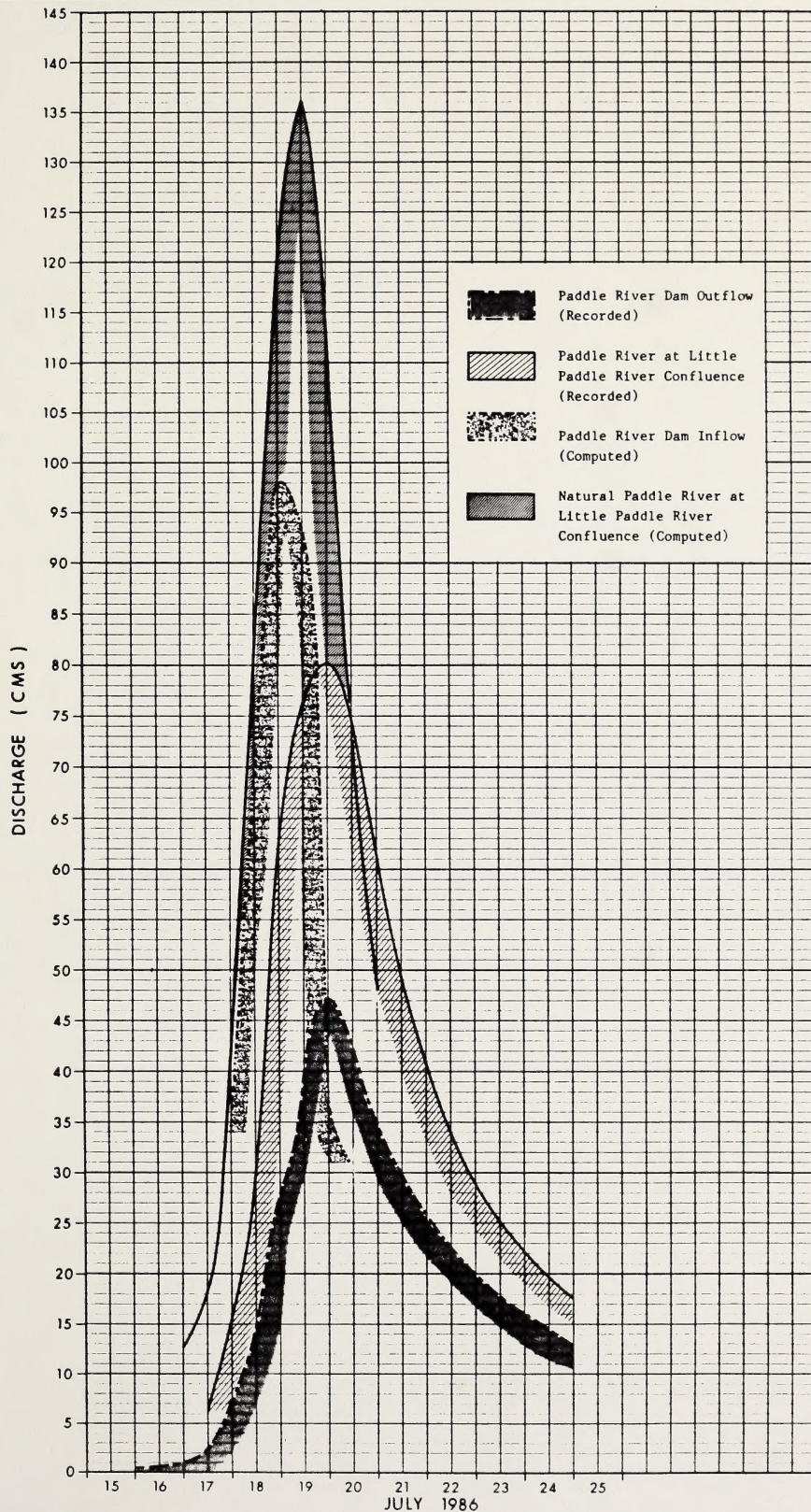




MICROFILM DATE

MICROFILM DATE

DRAWING No



**Aberna**  
ENVIRONMENT

TECHNICAL SERVICES DIVISION  
HYDROLOGY BRANCH

IMPACT OF PADDLE RIVER DAM  
ON THE JULY 1986 FLOOD

SUBMITTED R. BOTHE, P. ENG.  
DATE NOV., 1986

DESIGNED R. BOTHE, P. ENG.  
CHECKED

APPROVED M. MUSTAPHA, P. ENG.  
DATE NOV. 1986

DRAWN V. DA SILVA  
CHECKED

SCALE AS SHOWN  
DATE NOV., 1986

FIGURE No. 3

FILE No







N.L.C. - B.N.C.



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